

FLYING STAGE OF THE DEER LOUSEFLY, *LILOPTENA*
DEPRESSA (SAY), IN CALIFORNIA
(Diptera, Hippoboscidae)

BY JOHN EDWARD HARE
University of California, Berkeley

Lipoptena depressa (Say) is a common bloodsucking ectoparasite of deer (genus *Odocoileus*) in western North America. As in other Hippoboscidae the females are larviparous, depositing at short intervals single full-grown larvae which immediately pupate.¹ The pupating larvae are smooth and clean, dropping from among the host hairs to the ground where the entire pupal period is passed. At emergence the imago possesses fully developed though fragile wings and flies among the trees in the woodland haunts of the host. This stage of the parasite, here called the *volant*, survives but a few days in the absence of the normal host. Upon reaching a deer, the volants immediately crawl between the hairs and begin to suck blood. Here they remain as permanent parasites for the rest of their lives, soon losing the wings by a simple process of wear.

In the course of a detailed study of the complete life history of this species over a period of six years, numerous observations have been made of the occurrence and behavior of the volants in California. The present paper is concerned only with the volant phase, i.e., that portion of the life cycle beginning at emergence from the puparium, and the subsequent events which lead to the finding of a host.

Little published information exists on the biology of *L. depressa*, and this almost exclusively concerns the parasitic stage on the deer. Spencer (1939) believed that young flies probably emerge at intervals throughout the spring in British Columbia, basing his conclusions on a study of mature parasites taken from deer carcasses in November. Bequaert (1942) mentions that flights of many winged, newly emerged individuals of both sexes are often observed in the fall, when they frequently alight on people and are said to bite readily. Cowan (1943) states that

¹ The gestation period of *L. depressa* is three to four days as found by experiments with captive deer, soon to be reported. Cowan (1943) estimated a two months period; Herman (Calif. Fish & Game, 31 (1), 1945) has repeated this figure.

volants often alighted on his clothing, and from rearing experiments on puparia deposited by females removed from dead deer, he concluded that emergence in the wild occurs from June to November in British Columbia. Herman (1945) includes photographs of the volant, puparium and parasitic female of *L. depressa*, as *Neolipoptena ferrisi* (Beq.)

I have observed and collected free flying volants in California at the following localities: Binkley Ranch, near Kelseyville, Lake County; 17-mile Drive, Carmel, Monterey County; Sespe Gorge, near Ojai, Ventura County; Mt. Diablo, Contra Costa County; Redwood Canyon and Strawberry Canyon, Alameda County. No attempt was made to survey the entire state to establish the geographic limits of distribution, but in general it may be said to coexist with that of the deer hosts.

Volants of *Neolipoptena ferrisi* (Bequaert) (*Lipoptena subulata* Ferris and Cole) have been collected along with *L. depressa* on only two occasions (Lake County, Ventura County) and then in very small numbers. *N. ferrisi*, although it accompanies *L. depressa* infestations on deer in many parts of California, appears to be more limited in distribution, at least with respect to coastal California.

Bequaert (1937, 1942) lists specimens of *L. depressa* from 29 of the 58 counties of California, from Humboldt, Trinity and Lassen in the north, to Orange, Riverside and San Diego in the south, and from the Pacific Coast to the Sierra Nevada Mountains. The races of *Odocoileus hemionus* (Mule and Blacktail deer) are widely distributed in California, according to Dixon (1934) and Cowan (1936), and are absent only from the hot interior valleys and from the Great Basin Desert region of southeastern California. The presence of infested deer in a given area, as determined by examination of carcasses during the hunting season, would indicate the occurrence of the volant stage in the same general area. Wherever intensive search was made in localities known to be frequented by deer, volants have sooner or later been found. In certain cases, notably Carmel, Mt. Diablo and Strawberry Canyon (Berkeley), many hundreds of volants have been observed and collected at frequent intervals during the warmer months of the year.

The conclusions here presented are based on a total of over 70 daily field trips, of which approximately 50 refer to the

Strawberry Canyon, Alameda County, locality, which served as the primary field station for the observation of wild volants.

SEASONAL OCCURRENCE

My earliest records for the year for the appearance of *L. depressa* volants are: March 26, 1941, 35 flies, Mt. Diablo; March 28, 1942, 24 flies, Mt. Diablo; March 18, 1944, 3 flies, Berkeley hills. Trips made to these localities during January and February of several years were negative. From March onward the volants appear in ever-increasing numbers as the weather grows warmer, until a peak is reached in the latter part of July, at which time as many as 200 flies have been caught in one hour, in an area of one acre. In the Berkeley station, for which I have the most complete records, the volant population appears to diminish during the months of August and September. Volants continue to occur in fairly good numbers on warm days in October and November, and four flies were caught flying as late as December 8, 1943. Volants have also been collected in August in Ventura County, September in Lake County, and October in Monterey County. On October 5, 1938, the flies were exceedingly numerous along 17-Mile Drive, Monterey County, and over 500 specimens were collected by three collectors in less than two hours. This indicates that the seasonal peak may extend into late fall in some localities.

VOLANT AND HOST ECOLOGY

It is to be expected that the ecological niche of the volant stage of *L. depressa* integrates with that of the host, since this stage of the cycle is devoted entirely to bringing it, fresh from emergence from the puparium in the forest floor, into contact with its host.

Bequaert (1942) gives the following as the normal, breeding hosts of *Lipoptena depressa*: *Odocoileus hemionus hemionus* (Rafinesque)—Rocky Mountain Mule Deer; *O. h. columbianus* (Richardson)—Columbian Blacktail Deer; *Odocoileus virginianus leucurus* (Douglas)—Western White-tailed Deer; *Cervus canadensis* (Erxleben)—the Wapiti or American Elk. The normal ecological pattern in California concerns races of *Odocoileus hemionus* only. Bequaert's list of specimens examined includes a record from *Odocoileus hemionus californicus* (Caton), and

in the absence of host identification of many other series of specimens, the localities given would indicate that *O. h. inyoensis* Cowan and *O. h. fuliginatus* Cowan may also be normal hosts of *L. depressa* (based on Cowan's study of the distribution of Pacific Coast Deer, 1936). The only California race of *Odocoileus hemionus* for which there seems to be no evidence, direct or indirect, of infestation by *L. depressa*, is *O. h. eremicus* (Mearns), the Burro Deer. According to Cowan, this race is found in California only in the extreme southeastern corner of the state, in the Lower Sonoran life-zone, chiefly below 1500 feet. This race of deer is isolated from the coastal races by the Colorado Desert, and has habits which are different from the *hemionus* Rassenkreis as a whole. Blacktail deer in California inhabit mainly the Transition and Boreal zones, but are also abundant in the Upper Sonoran chaparral belt of the coastal region, from Mendocino County southward. Cowan states that in the coastal regions the habitats favored are Redwood, Scrub Oak, and chaparral, while in the Sierran region the foothill chaparral belt and the Yellow Pine-chaparral association support the bulk of the population. Dixon (1934) considers California Mule Deer to be characteristic inhabitants of the Yellow Pine and White Fir forests in the central Sierran region, and has observed herds at elevations up to 11,000 feet.

From the above account it may be concluded that deer are to be found under a wide variety of floristic conditions, at all elevations up to at least 10,000 feet, and absent only from the most arid portions of the Lower Sonoran zone (cf. Grinnell, 1939).

At the collecting localities mentioned above, volants of *L. depressa* were collected in a number of different plant associations: Digger Pine, *Pinus sabiniana*, Lake County; Monterey Pine, *Pinus radiata*, mature growth—Monterey County, young growth—Alameda and Contra Costa counties; Cedar, *Chamaecyparis thyoides*, young plantings, Strawberry Canyon, Alameda County; Redwood, *Sequoia sempervirens*, Redwood Canyon, Alameda County; Pine-Oak-Juniper association (*Pinus sabiniana-Quercus douglasii-Juniperus californica*) Mt. Diablo, Juniper Camp, Contra Costa County; Laurel-Oak association (*Umbellularia californica-Quercus agrifolia*) Redwood Canyon; Willow-wild rose thicket (Riparian mountain meadow) Ventura County.

The volant habitats are all mesophytic in nature, when con-

trasted with the adjoining grassland and chaparral formations usually present at the same localities, but which are almost universally negative with respect to volants. Among the factors which appear to be important are, 1) moderate to dense shade (which directly modifies the temperature relations and the evaporation rate) and 2) shelter from wind. The shade factor is also involved in the production of a light-shade edge pattern which is commonly present in the volant habitats. The ecological relations of the light-shade edge will be discussed later.

Deer beds and other fresh sign were commonly present in the same vicinities as the highest volant densities. The highly localized occurrence of volants in these areas suggests that the flight range is quite limited.

In localities where the volants are habitually present, and during the warmer hours of the day, considerably more flies can be caught on the body of the collector than in a net. It is more accurate to say that the flies seek out the collector than the reverse. The volants have the habit of alighting suddenly on almost any part of the body, clothed or exposed. Here they pause for a fraction to several seconds, and then just as suddenly fly off again. By acting quickly, it is possible to capture the flies while they remain on the skin or clothing, by grasping them lightly between the fingers, or by inverting a collecting tube over them. The volants are small (3 mm.) flat, brown flies, with tough leathery bodies which can withstand considerable pressure and handling without injury, other than occasional tearing of the delicate wings.

Localities were surveyed simply by traversing, meanwhile being on the alert for any volants which might alight on the body. Specimens were obtained in this way even when the population density was so low that continuous beating for long periods did not yield a single fly by the conventional method. Sweeping and beating were useful during cold or wet weather or in the very early morning hours, when inactive or sluggish volants could be swept from edge foliage of trees, shrubs or grass in the same localities.

Of a total of over 600 individually recorded observations on volant behavior, approximately 17 per cent alighted on my body while I stood or moved in direct sunlight, another 17 per cent while in deep shade, and the balance, 66 per cent, occurred in or

close to the interzone produced at the edge of the distinct shadow cast by the trees which border the woodland formations. The occurrence of volants at this light-shade edge was very characteristic, and the highest frequencies of landings always took place here. Landings were most numerous when moving from shadows outward to bright sunlight, less when moving along the shadow edge, and least when moving from sunlight into shadow at right angles to shadow edge.

A similar behavior has been reported for the volants of *Lipoptena cervi* in Germany, by Schroeder (1911) who describes how over 100 specimens were caught as they alighted on several people crossing a clearing in a forest in Pomerania, in October. No details were given by Schroeder, but to collect that number of volants by hand requires time and care, and one may assume that the members of his party moved about the clearing while awaiting the flies.

The behavior of *L. depressa* volants may be attributed to the interaction of a number of responses, which probably include a phototaxis, form vision and light adaptation, and perhaps also detection of moving objects. Experiments have been conducted on the photic responses and other orientations of the volants, as well as on newly established and old feeding flies, and these will be reported in a later paper.

It is interesting to note that the behavior of tsetse flies, which in many ways are ecologically equivalent to the volant *L. depressa*, resembles closely that described above. Schwetz (1919) states that *Glossina fusca* Walker occurred almost exclusively along paths and roads bordering forests. *G. palpalis* R.-D. according to Fiske (1920), when in search of a host, follows game trails, lake shores and stream banks, and in general follows the line between shadow and sunlight, being averse to penetrating shadow where light is not evident beyond, and vice versa.

Swynnerton (1936) describes the "vegetational concurrence" required by *G. morsitans* Westw. for example, which requires both a savannah of sufficient shade value, and open glades in which to hunt prey. The feeding grounds are on sections of paths or glades and passes between thickets. Jackson speaks of the same species (1941) living in restricted "ambits", congregating along the "contact line of woodland and swamp, often in a special interzone including trees not found in either of the other types".

He states that the interzone provides good visibility and attractive conditions for the hosts, while the shadier woodland offers breeding and resting haunts.

The habits of the hosts of *L. depressa*, so far as they are known, fit into the volant pattern very well. Dixon (1934) states that mule deer in California spend the middle of the day bedded down in cool secluded nooks, such as groves of pines provide. Other bedding places are wild plum thickets, rocky ridges and hemlock thickets. To reach these spots, the deer must travel from the early morning feeding grounds in meadows and chaparral-covered hillsides, traversing patches of woodlands and the forest edges on the way. Here the volants have adequate opportunity to alight on the slowly moving or even momentarily stationary deer still browsing as they go. The bedding-down places are usually close to the forest edge, as the wary animals prefer a spot with an unobstructed view on one or two sides. In late fall and winter sunny nooks are sought for sun baths (Dixon, 1934, p. 35). As the shadows shift, the deer change their position, and move to other sun-bathed spots. This is precisely where volants habitually occur. The responses to temperature are also conducive to the rendezvous. Volants tend to retire into the deeper shadows on the warmest summer days, but on cool spring and fall days, the flies congregate in the warm sunny glades bounded by dense shadows. I have found by personal experience with captive blacktail deer that these animals are extremely light-shy on hot summer days, and seek the cool shadows whenever permitted. The reverse is true in cool weather.

DIURNAL CYCLE

During the night and in the first hours after dawn, volants may be recovered from foliage in the same localities where flights are made during the day. Crawling activity evidently begins as soon as light is present, when the temperature permits sluggish movement. Sluggish volants, their bodies wet with dew, have been observed dropping from branches of trees overhead as early as 5 A.M., just before dawn, on a cool foggy morning (13° C.). Volants kept at 10° C. overnight, move the legs and attempt to crawl almost immediately when brought into light.

Flights have been observed as early as 6:30 A.M. (still air temperature in this particular case was 18.0° C.) when the sun

was one hour above the horizon. The volants are also active on days with low fog, temperature permitting. The coolest conditions under which volants were seen flying, were recorded on December 1, 1943. From 1:20 P.M. to 2:30 P.M. the shade air temperature was 12.7–13.0° C. while the sunny air temperature was 18.5–23.0° C. Six volants were caught alighting on my body during this time. On another occasion, flight was slow and clumsy at 14–17° C., on a day with a low fog, which excluded the possibility of a warming effect by direct sunlight. The flies were seen to vibrate their wings several times before taking off in flight. This does not happen on warmer days, and suggests that under the cooler conditions, it is necessary for the volants to raise the internal temperature for proper function of the flight muscles, as pointed out by Wigglesworth (1939, p. 90) for other insects.

Optimum range of temperature for flight under field conditions appears to be 18–24° C. When the shade air temperature exceeds 25° C. the number of flies appearing at the forest edge decreases, as compared with average numbers caught on cooler days. The few flies present tend to remain in the deep shade, where they continue flying and resting activities. A similar type of reaction has been described for *Glossina morsitans* by Jack and Williams (1937) who found that as the temperature rises above 32° C. the response to light changes from photopositive to photonegative. They also showed that lowering the humidity lowers the threshold for this change in photic response.

Volants continue to make short flights throughout the day, frequently alighting on trunks and branches of trees, foliage and grass, where they rest briefly, and fly off again. One receives the impression of almost constant activity on the part of the flies. This restless behavior continues when the volants are put into dry collecting vials, where rapid crawling and flying still occur. Only with the coming of darkness and a drop in temperature does volant activity cease. Those flies surviving a longer period of starvation remain inactive on vegetation for the night and resume the search for a host the following day.

Cowan (1943) kept seven newly emerged volants of *L. depressa* over damp sand at room temperature. The maximum period of survival was 72 hours, average 57 hours. I have conducted

numerous survival experiments with reared as well as wild volants, and a brief summary of results will be given.

Volants of *L. depressa* lived from one to eight days after emergence from the puparium. The maximum survival was obtained with a group of reared flies emerging from normal puparia collected from captive deer. A total of twenty emergents were kept in small (20x6 mm.) vials plugged with cotton, in normal laboratory daylight, at room temperature and humidity: 50 per cent mortality at 4½ days, maximum survival, 1 fly 8 days. Wild caught volants, kept at 84 per cent relative humidity and 22.0–22.8° C. lived up to 3½ days, 50 per cent mortality at 1½ days, when kept under daylight conditions; when kept in dark cabinet, other conditions same, wild volants lived up to 6 days, 50 per cent mortality at 3¼ days. At 98 per cent R. H. and 16–19° C. wild volants lived up to 6 days, 50 per cent mortality at 4 days, when kept in dark cabinet. Lowering the humidity increases the mortality rate and shortens the maximum survival time. At room temperature and humidity, 75 per cent of wild volants kept in large glass jars die the first day. Factors which decrease the activities of the flies, hence the energy expended, tend to increase the maximum survival time and to lower the mortality rate. Such factors include: limiting the space for walking and flying, cutting down or excluding light, and lowering the temperature. A similar relationship was found for *Pseudolynchia canariensis* (Macq.) [*P. maura* (Bigot)] by Prouty and Coatney (1934), where longevity without food was 77-109 hours in direct proportion to the energy used up in activity.

Under natural conditions, the volant *L. depressa* may be expected to live and remain active for one to four days. Rearing experiments with captive deer indicate that 50 per cent of those volants still fairly active 4 days after emergence, can successfully establish on the host. One-day-old flies are 75 per cent successful.

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FIVE NEW SPECIES OF ALEYRODIDAE FROM
CALIFORNIA
(Homoptera)

BY W. W. SAMPSON
University of California, Berkeley

Among the Aleyrodidae collected by the writer in California are five species whose characters do not resemble those of other described forms. These apparently new species are described herein. Holotypes and certain paratypes will be deposited in the California Academy of Sciences.

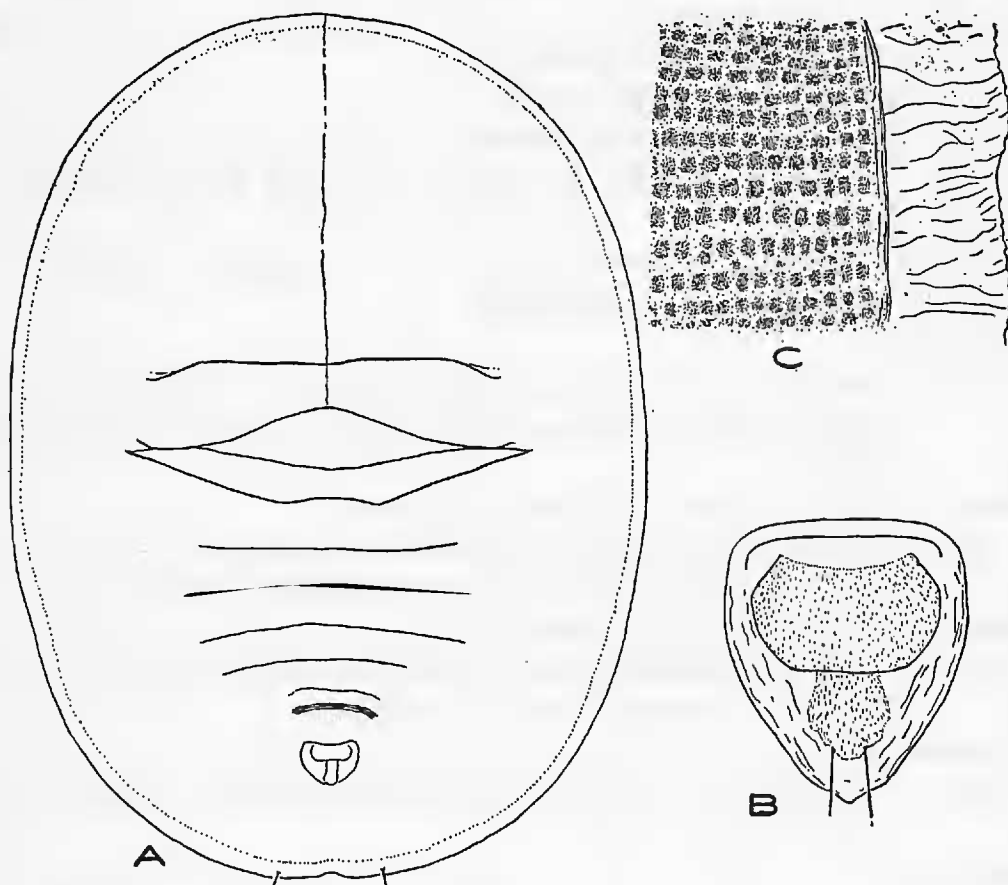


Fig. 1. *Aleyrodes osmaroniae* Sampson. A, pupal case. B, vasi-form orifice. C, margin of case.

Genus ALEYRODES Latreille, 1810

Aleyrodes osmaroniae Sampson, new species
(Fig. 1)

Pupal case. Size 1.28 mm. long by 0.97 mm. wide; shape broadly elliptical; margin slightly irregular, chitinated for a width of 0.35 mm.; behind the chitinated margin there occurs for some distance groups of dotted areas; vasi-form orifice subcordate and striated, the posterior margin pointed, operculum roundly trape-

zoidal, setose, lingular three-quarters the length of orifice, the two setae projecting beyond the margin of the orifice; caudal margin of body slightly indented and bearing two setae.

Color of case bright lemon yellow; without wax secretion.

Adults. Not known.

Collected by the writer from *Osmaronia cerasiformia* in Strawberry Creek Canyon, on the Campus of the University of California, BERKELEY, CALIFORNIA, June 14, 1941, along with *A. spiraeoides* (Q.) from the underside of the leaf.

This species differs essentially from *Aleyrodes spiraeoides* (Quaintance) by having the chitinized margin.

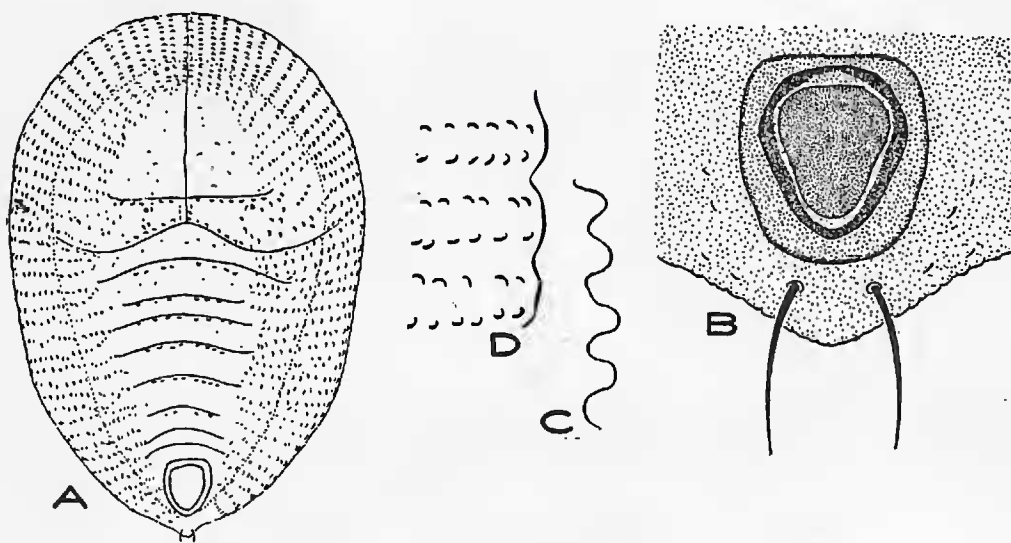


Fig. 2. *Tetralicia ceanothi* Sampson. A, pupal case. B, vasi-form orifice. C, margin of case. D, apparent margin of case.

Genus TETRALICIA Harrison, 1917

Tetralicia ceanothi Sampson, new species (Fig. 2)

Pupal case. Size 0.623 mm. long by 0.540 mm. wide; shape broadly ovate, narrowing posteriorly; margin toothed, eight teeth in 0.0783 mm. wax tubes well developed; deflexed portion of case about one-fourth the width of case, 0.0703 mm. wide; apparent margin bears bidentate projections, which are the two rows of imbrications running over the edge to the deflexed portion; there are about 88 of these double rows of imbrications, which extend from the edges of the faintly indicated body segments to the margin; a few single imbrications are scattered over the dorsum; thoracic transverse slit not reaching apparent edge of body; vasi-form orifice subcordate, set in a roundly rectangular, chitinized area; operculum subcordate, nearly filling orifices; lingula hidden;

posterior prolongation slightly developed, bearing two long setae.

Case black, resting on a small amorphous mass of wax.

Adults. Not known.

Collected by Nathan Stahler and Thomas Kelly from *Ceanothus cuniatus* near BISHOP, CALIFORNIA, March 29, 1940.

This species is related to *Tetralicia nigrans* (Bemis), but differs essentially from it by having the wide chitinized area around the vasiform orifice and by having imbrications on the dorsum.

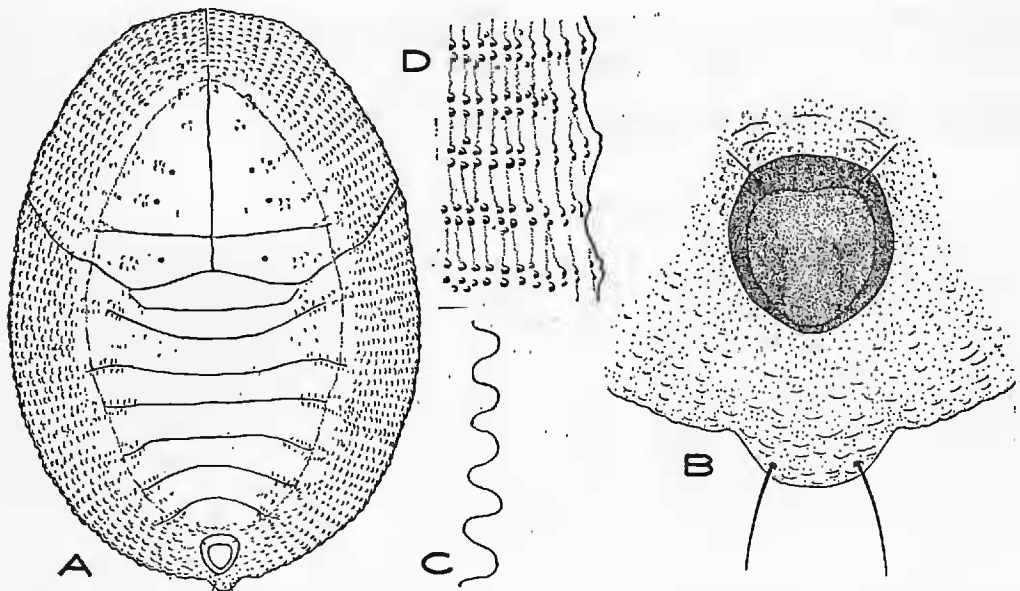


Fig. 3. *Tetralicia sierrae* Sampson. A, pupal case. B, vasi-form orifice. C, margin of case. D, apparent margin of case.

Tetralicia sierrae Sampson, new species

(Fig. 3)

Pupal case. Size 0.820 mm. long by 0.450 mm. wide; shape elliptical; margin toothed, four teeth in 0.117 mm.; deflexed portion of case about one-third the width of case, 0.0783 mm. wide; apparent margin bearing bidentate projections with a smaller one in between each, the projections being the appearance of double rows of granules on the edge of the deflexed portion; the granules are lacking in the medium line of the dorsum; thoracic transverse slit reaching edge of apparent margin; vasiform orifice cordate, raised, slightly longer than wide; operculum cordate, filling orifice; lingula hidden; posterior prolongation well developed, bearing two long setae.

Case black, with a thin fringe of wax.

Adults. Not known.

Collected by the writer from an undetermined, low spreading shrub at TRUCKEE, CALIFORNIA, June 25, 1940.

This species is related to *T. ceanothi*, but differs essentially from it by having the case granulate and by not having the wide chitinized area around the vasiform orifice.

Genus *TRIALEURODES* Cockerell, 1902
Trialeurodes californiensis Sampson, new species
(Fig. 4)

Pupal case. Size 1.07 mm. long by 0.74 mm. wide; shape broadly elliptical; margin entire, slightly irregular, with a few faint folds behind it; a single row of long pointed papillae lie behind the margin, nine in 0.16 mm.; behind the papillae are one or two rows of tiny clear pores, some of which are doubled, the same type of pores occur along each side of the abdominal ridge, one to each segment, and another row further out, as well as a few on the

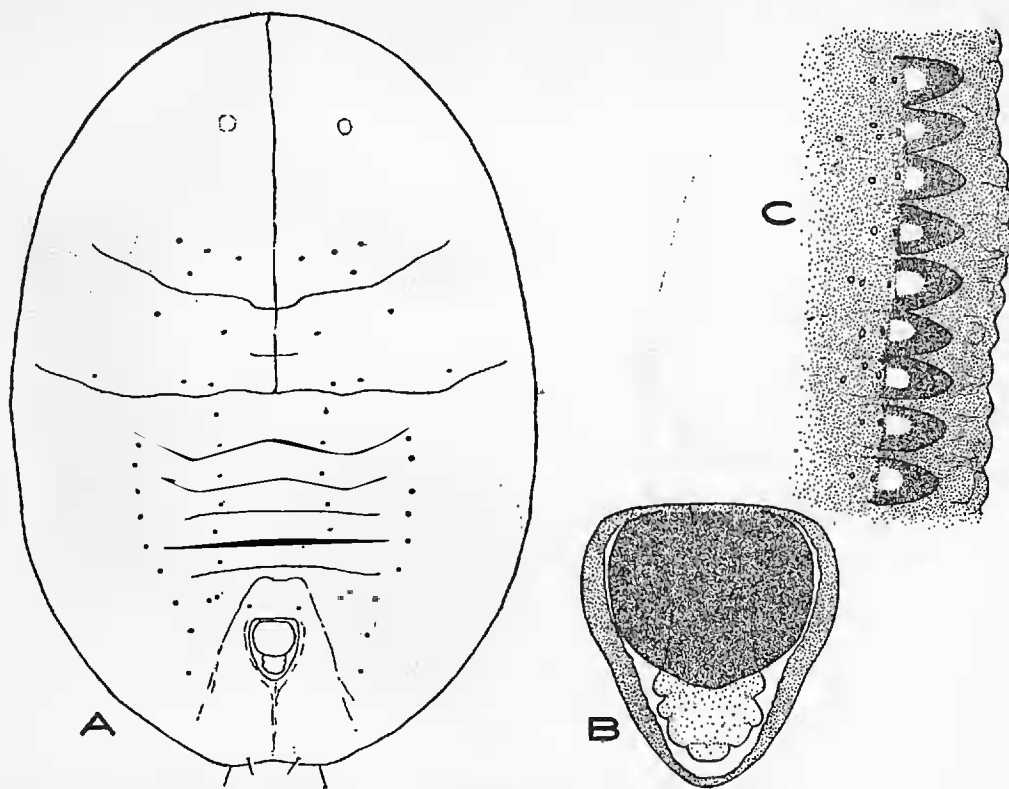


Fig. 4. *Trialeurodes californiensis* Sampson. A, pupal case. B, vasiform orifice. C, margin of case.

thorax; vasiform orifice subcordate; operculum rounded, filling about half of the orifice; lingula trilobed on each side, without setae nearly reaching to posterior margin of orifice; caudal furrow indicated; two pairs of hairs are located on the posterior margin.

Case black, with a fringe of wax up to one-half the width of case, dorsum without wax; case slightly elevated above wax fringe. Appears very much like immature forms of *Tetraleurodes stanfordi* (Bemis).

Adults. Not known.

Collected by Dr. M. A. Cazier at GUERNEVILLE, CALIFORNIA, March 15, 1939, and at ANTIOCH, CALIFORNIA, by E. A. Drews and by W. W. Sampson, April 8, 1940, from *Quercus* sp.

This species differs essentially from *Trialeurodes wellmanae*

(Bemis) by being black and lacking the large semi-transparent areas on the cephalo-thorax.

***Trialeurodes drewsi* Sampson, new species**

(Fig. 5)

Pupal case. Size 0.78 mm. long by 0.48 mm. wide; shape narrowly elliptical; margin regularly crenulate, five crenulations in 0.157 mm.; an irregular row of small papillae occurs behind the margin, along with a few larger in size but fewer in number; dorsum bearing about nine pairs of stomata-like pores on the central portion, and two pairs of small papillae toward the lateral ends of the transverse thoracic slit and a larger pair on the cephalo-thorax; vasiform orifice subcordate, ribbed; operculum

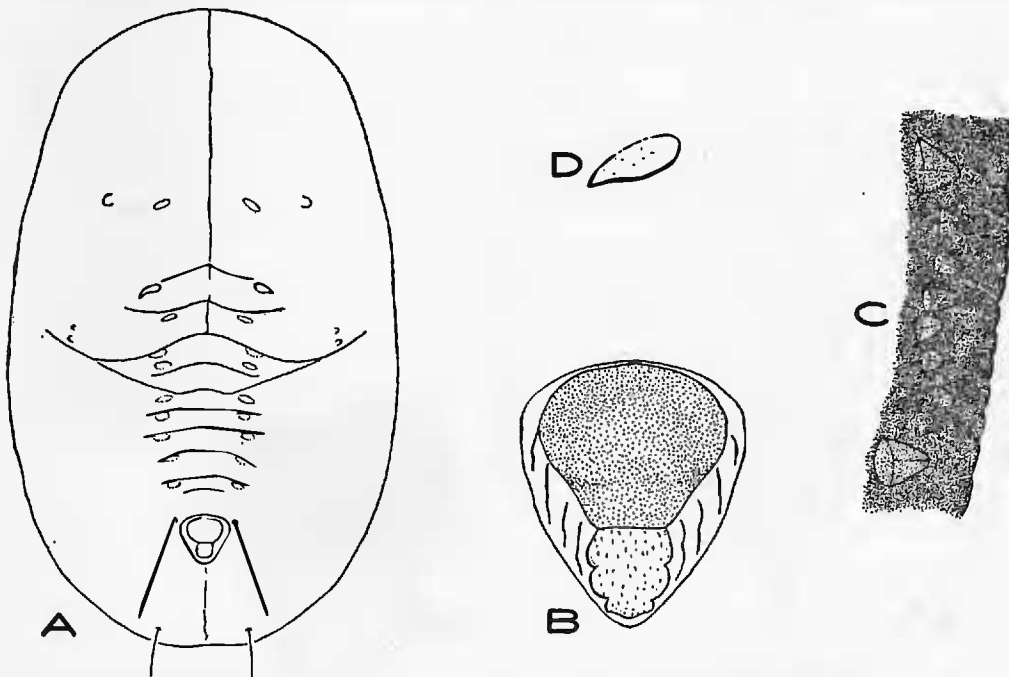


Fig. 5. *Trialeurodes drewsi* Sampson. A, pupal case. B, vasi-form orifice. C, margin of case. D, stomata-like pore.

elongately trapezoidal, narrowing posteriorly, filling slightly more than half of the orifice; lingula nearly reaching the edge of orifice, trilobed on each side, and without setae; two setae much longer than the vasiform orifice occur near the orifice, and two near the caudal margin of the case.

Case black, greatly elevated on a palisade of white wax; dorsum covered with a layer of clear wax bearing numerous spines of clear wax.

Adults. Not known.

Collected by the writer from *Quercus* sp. at MT. TAMALPAIS, MARIN COUNTY, CALIFORNIA, March 16, 1941.

This species is related to *Trialeurodes tentaculatus* (Bemis), from which it differs by being black in color and having the stomata-like pores.

NEW GENERA AND SPECIES OF TRICHOPSENIINAE
FROM AMERICAN AND AUSTRALIAN TERMITE NESTS

(Coleoptera, Staphylinidae)

BY CHARLES H. SEEVERS

Research Associate, Chicago Natural History Museum

The staphylinid beetles of the subfamily Trichopseniinae constitute a small but very interesting element of the alien insect fauna inhabiting termite colonies. Among the termitophilus beetles they are notable chiefly because of their association with the more primitive termites, and for their wide geographic range which includes both hemispheres. The great majority of groups of termitophilous insects are restricted to one hemisphere or the other, but the thirteen known Trichopseniine species were found in Argentina, British Guiana, the United States, Java, Sumatra, and Australia.

The intent of this paper is to describe the new forms which have been acquired since an earlier report¹ in which I proposed that the Trichopseniinae be given subfamily status because of their distinctive metasternal structure, hind-leg articulation, and male genitalia.

The most noteworthy addition to the subfamily is its first Australian representative, the bizarre genus, *Mastopsenius*. The peculiar facies of *Mastopsenius* scarcely indicates relationship to *Trichopsenius*, but this is in line with the subfamily tendency for each genus to develop its own distinctive habitus. The diversity within the group is more apparent than real for in most respects the basic morphological features are rather similar. The host relationship of *Mastopsenius* is especially interesting, for its host, *Mastotermes darwiniensis* Froggatt, is the most primitive of present-day termites, and sole living representative of the family Mastotermitidae, while the other Trichopseniinae are guests of the Rhinotermitidae.

With more material available for study, it is now evident that the North American genus *Trichopsenius* is comprised of at least

¹ Seevers, C. H. 1941. Taxonomic investigations of some termitophilous Staphylinidae of the subfamilies Aleocharinae and Trichopseniinae (new subfamily). *Ann. Ent. Soc. Amer.*, 34:318-349, 3 pl.

four species instead of one. The literature records *Trichopsenius depressus* Leconte as ranging from Massachusetts to California, but closer study shows that all of the specimens are not conspecific. It is clear, also, that some degree of host specificity exists, and that each species of *Trichopsenius* is restricted to one or a few species of *Reticulitermes*.

The staphylinid beetle, *Schizelythron javanicum* Kemner², collected from the nest of *Schedorhinotermes javanicus* Kemner, at Buitenzorg, Java, should be included in the Trichopseniinae rather than in the Aleocharinae where placed by Scheerpeltz³. Although I have not seen this species, I have no doubt of its relationships; the distinctive Trichopseniine metasternal and hind-leg characters are plainly evident in Kemner's illustrations. *Schizelythron* derives its name from a remarkable character; each elytron is split lengthwise from near the base to the apex, and the lateral half diverges strongly from the medial part.

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Mastopsenius Seevers, new genus

Body robust, fusiform; sparsely setose; head moderately deflexed, compressed; clypeus very short; antennae elongated, antennomeres 3-9 campanulate; eyes large; gula sclerotized; mentum strongly transverse, sides rounded, apex emarginate; ligula bifid; labial palpi 3-segmented (third segment bearing a tiny spicule), its second segment elongated and with sides subparallel, the slender third segment articulating with its apex; maxillary palpi 4-segmented, the slender second segment increasing uniformly in width distally, the fourth segment narrowly conical, without a terminal spicule.

Pronotum robust, strongly transverse, anterior and lateral borders margined, basal border margined only along outer one-fourth; surface of pronotum strongly deflexed at base (medially) forming a conspicuous posterior "face" of the pronotum; elytra narrower than pronotum, sides and apical margin uniformly rounded, apical

² Kemner, N. A. 1925. Javanische termitophilen I: *Schizelythron javanicus* n. g., n. sp., eine neue physogastric Staphylinide von einem neuen, nicht zu den Aleochariden gehorigen Typus, nebst biologischen Bemerkungen uber *Jacobsonella termitobia* Silv. Ent. Tidskr., 46:107-126, 1 pl.

³ Scheerpeltz, O. 1934. Staphylinidae VIII. Coleopt. Cat. 130: 1501-1881.

angles obsolete; wings present; prosternum broadly tuberculate medially; mesosternum large, with a slender carinate process meeting a similar process of the metasternum between the middle coxae; metasternum relatively short caudad of the middle coxal cavities, and relatively narrow, its width from median line to side margin scarcely greater than the width of the large metepisternum; metasternal lobe only moderately large, approximating the size of the posterior trochanter.

Mesothorax, metathorax, and the basal abdominal segments greatly swollen; abdomen conical, its sclerites frequently separated, exposing white membranous areas; paratergites absent; lateral plates of ninth segment stout, cylindrical.

Legs moderately stout; tibiae with a few terminal spines; tarsi 5-segmented, basal tarsomere of middle and hind legs greatly elongated.

Genotype. Mastopsenius australis n. sp.

The position of *Mastopsenius* within the subfamily is not clear at this time. Recognition of the genus should offer no difficulty in view of its distinctive form, its antennal, pronotal, and elytral peculiarities, and its host relationship.

***Mastopsenius australis* Seevers, new species**
(Figs. 1, 2)

Head brown; antennomeres 1-3 flavotestaceous, 4-10 with basal one-third black and remainder brown; pronotum dull to shining black, with a median reddish area; elytra piceus to dark brown; abdominal sclerites bright reddish-brown, lateral plates of ninth segment dark brown; legs brown, coxae, trochanters and femora with dusky margins. Head with a pair of bristles on vertex between antennae and one on clypeal margin in front of antennal fossa; pronotum with four transverse, irregular rows of approximately ten fine hairs; elytra also bearing four highly irregular rows of fine hairs; abdominal sclerites sparsely and uniformly clothed with fine, erect hairs. First antennomere strongly clavate (its medial surface concave), three times as long as the second segment, segments 3-4 subequal in length, segments 5-7 a trifle longer, 8-10 decreasing in length, apical segment longer than penultimate. Anterior tibia with terminal ring of uneven spines (8-10); middle tibia with four terminal spines and several spinules; hind femur and tibia subequal in length, tibia more slender, increasing in width from base to apex; bearing one stout apical spine medially and six or so spinules; basal tarsomeres of prothoracic leg decreasing in length, fifth equal to three preceding segments; basal tarsomere of mesothoracic leg three-fourths as long as tarsomeres 2-5, fifth a little shorter than 2-4; basal tarso-

mere of metathoracic leg longer than segments 2-5, fifth a trifle longer than 3-4 combined. Length, 5.5-6.2 mm.; width, 2.5 mm.

Holotype. A male from TOWNSVILLE, QUEENSLAND, AUSTRALIA; collected June 1, 1938, by Dr. M. F. Day; in the collection of the writer. *Paratypes*. Two males, same data as the type; in the collection of A. E. Emerson and the writer. *Host*. *Mastotermes darwiniensis* Froggatt.

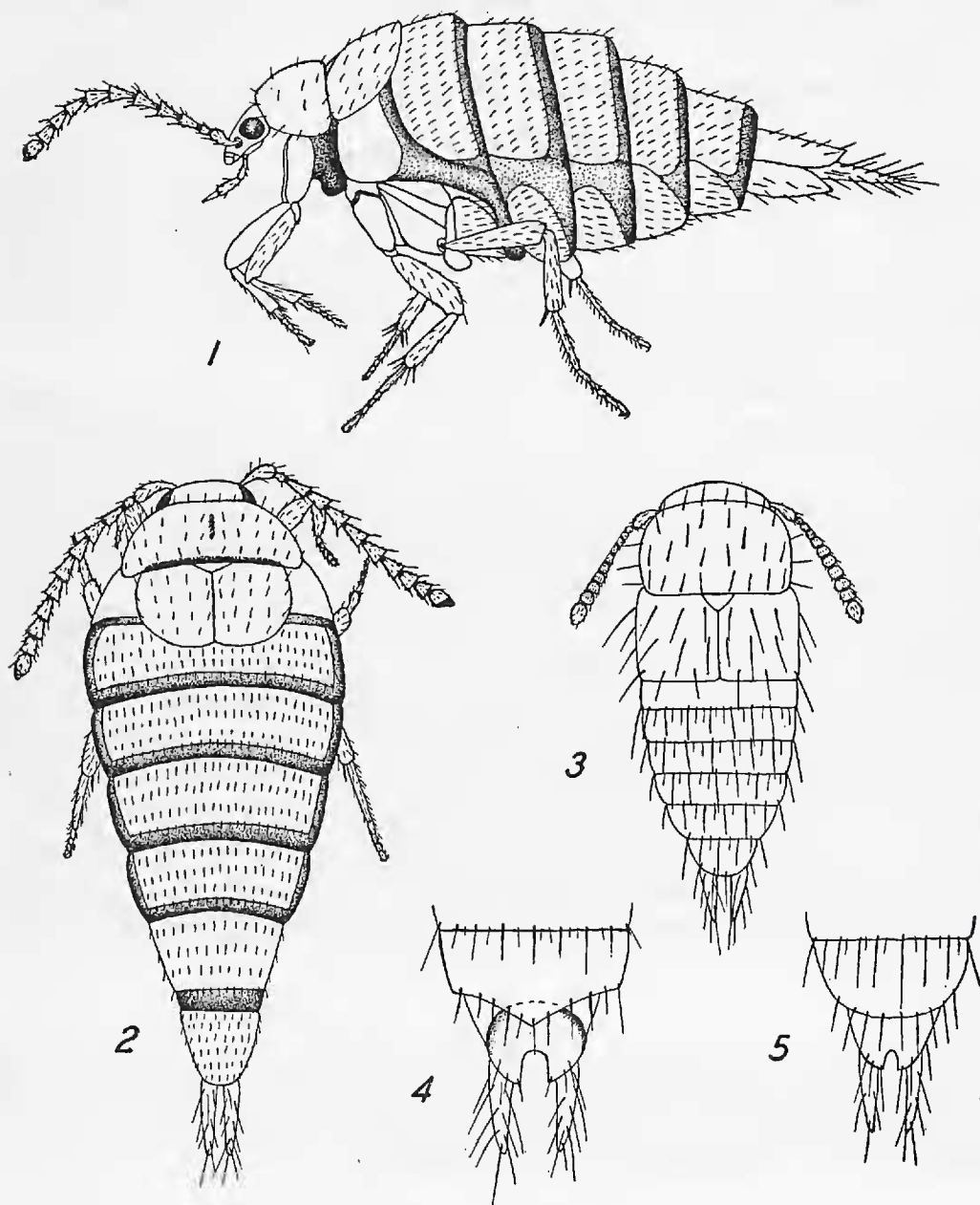
Megaxenistusa Seevers, new genus

Body cylindrical, sparsely setose; head deflexed, strongly compressed; clypeus extremely short; antennae inserted medial to the eye, antennal fossa separated from anterior tentorial pit by a distance equal to length of fossa; labrum feebly sclerotized at base, apical margin produced at middle; eyes large; antenna with broad flat scape (its medial surface concave) and with segments 2-10 subcylindrical; gula sclerotized; mentum trapezoidal, sides converging strongly; labial palpi 3-segmented (third segment with a tiny spicule), second segment asymmetrical, strongly compressed; maxillary palpi 4-segmented (fourth segment with spicule), long and slender, second segment arcuate, third fusiform, fourth conical.

Pronotum robust, transverse, surface depressed on each side of disc, not margined; elytra as broad as pronotum and longer, surface somewhat irregular, with broad shallow impressions, sutural margins not bevelled to form a median groove; wings present; mesosternum short; mesocoxae separated by carinate processes of mesosternum and metasternum; metasternum relatively short and broad; metasternal length (caudad of mesocoxal depressions) seven-tenths the distance from median line to the metepisternum (along the posterior margin); sides of metasternum strongly oblique (with respect to the horizontal plane); metasternal lobes moderate in size, not much larger than posterior trochanters; metepisternum large, four-fifths as broad (at caudal margin) as long. Abdomen stout, cylindrical; paratergites absent. Femora broad, compressed; tibia somewhat less so, sparsely spinose at apex; tarsi 5-segmented, basal tarsomere of middle and hind legs extremely long, exceeding the remainder of the tarsus in length.

Genotype. *Megaxenistusa rhinotermis* n. sp.

Megaxenistusa bears a general resemblance to *Xenistusa* Leconte (Florida to Texas), to which it is probably most closely allied, and from which it differs in these particulars: sutural margins of elytra not bevelled to form a v-shaped groove; metasternum short and broad (median length: distance from median line to side margin :: 7:10), in *Xenistusa* long and narrow (14:10); metepisternum four-fifths as broad as long, in *Xeni-*



EXPLANATION OF PLATE

- Fig. 1. *Mastopsenius australis* n. sp., lateral view.
Fig. 2. *Mastopsenius australis* n. sp., dorsal view.
Fig. 3. *Trichopsenius xenoflavipes* n. sp., dorsal view.
Fig. 4. *Trichopsenius depressus* Leconte, seventh and eighth tergites of female.
Fig. 5. *Trichopsenius frosti* n. sp., seventh and eighth tergites of female.